The Wasatch Front's Century Storm

NATIONAL WEATHER SERVICE-SLC WSFO

COLORADO BASIN RFC

Introduction

THE WASATCH FRONT'S CENTURY STORM

INTRODUCTION

A major fall storm produced phenominal amounts of rainfall in northern Utah with the heaviest rainfall in the Salt Lake Valley. The rains began Friday evening, September 24, 1982, and continued with only a few hours respite until Tuesday night, September 28, 1982. Severe flooding was experienced along Big/Little Cottonwood Creeks and the Jordan River with damage estimates in excess of 15 million dollars. Miraculously, no fatalities occurred. However, one woman almost drowned when she suffered an epileptic seizure and fell into a pond formed by the flood waters.

The rains were attributed to considerable tropical moisture that moved into Utah from dying Hurricane Olivia and the dynamics supplied from a cold front and its associated cold upper level trough. Hurricane Olivia was one of the strongest and most well organized hurricanes in many years with 165 MPH winds.

The rains began in extreme northern Utah Friday evening, September 24, when the tropical moisture was enhanced by a very weak cold front moving into Idaho and Montana. Rainfall amounts associated with this feature were light.

The main cold front moved southward and collided with the tropical air on Sunday morning, September 26, and produced torrential rains in Davis, Salt Lake, and Utah Counties. Rainfall amounts were generally around 2 to 3 inches in a 12-hour period with some amounts in the southeast portion of Salt Lake Valley, and in the canyons to the east, nearly 3.50 to 4.00 inches. These values exceed the 100 year 24-hour return for this area in the NOAA Atlas 2-Precipitation Frequency Atlas of the Western United States.

A Flash Flood Watch was issued at 9:00 A.M. Sunday, September 26 for the majority of northern Utah. As the severity of the storm was sensed, a Flash Flood Warning was issued immediately at 9:30 A.M., September 26 for Bountiful north due to flooding reported in Willard. As the cold front worked slowly southward along the Wasatch Front, it became apparent that it had the potential to stall in the Salt Lake Valley.

A warning was then issued at 11:00 A.M. Sunday, September 26 for the counties along the Wasatch Front from Salt Lake County northward from the Point-of-the-Mountain. The record rainfall began in earnest about 10:00 A.M. and lasted until about 11:00 P.M. Sunday evening. For this 12-hour period rainfall values were in the 2 to 3 inch range with some amounts in the Holladay, Sandy, Big and Little Cottonwood areas in the 3.50 to 4.00 range. The Alta Ranger Station recorded about 3.43 inches on Sunday, but received 1.28 inches of rain on Saturday, saturating the soil. The Cottonwood Weir climataological station recorded 4.10 inches from 10:00 A.M. to 11:00 P.M. Sunday, as did several National Weather Service spotters within several miles of this area. This was but a portion of the rains which were still to come.

The Flash Flood Warning for Salt Lake County was issued on Sunday, September 26, about 5 hours before any serious flooding was experienced. By mid afternoon flooding became severe along Big and Little Cottonwood Creeks. The heavy rainfall was centered along and downstream of these drainages. A record flow of 1,095 CFS was registered about 7:30 P.M. Sunday evening at Cottonwood Weir as Big Cottonwood Creek leaves the mountains and enters the Salt Lake Valley. The record spring snowmelt crest on Big Cottonwood was only 835 CFS on June 6, 1909. Little Cottonwood Creek peaked at 1,135 CFS around 2:00 P.M. Sunday afternoon with the previous record flow of 762 CFS on June 11, 1921. These creeks have a stream bed capacity of only 500 CFS. Record flooding in the past on these two creeks has been due to snowmelt, enhanced to a small degree by rainfall, but never entirely associated with heavy rains.

Another natural phenomenon that enhanced the situation was the heaviest rains were over the two Cottonwood Canyons which are from 40 to 60 percent granite rock formation. Mill Creek just to the north of Big Cottonwood Creek is nearly 100 percent dirt, trees, and shrubs. Mill Creek only rose to 46 CFS during the peak of the storm.

Runoff from urban areas added to the problem as the record flows from these two main creeks reached the valley areas. By late in the afternoon and evening hours, the flooding became severe. It was estimated that Big and Little Cottonwood in the Salt Lake Valley contained flows of 1,300 to 1,600 CFS rampaging through creek beds which normally hold around 400 to 600 CFS. This was very difficult to judge because such a great volume of water was out of the channel.

Additional Flash Flood Statements/Warnings were issued during Sunday afternoon, September 26, with emphasis placed on the severe nature of the flood situation and the additional problems of mud slides in the canyon along the Wasatch Front after one slide was experienced in Little Cottonwood Canyon. Many mud slides were later reported.

As the flood waters roared through the central and southern portions of the Salt Lake Valley, the relentless rains continued. Hundreds of people were being evacuated from their homes, mainly those which were close to flooded streams. Flood waters did extensive damage to the Willow Creek Condominiums and Trailer Park in the Cottonwood Cove.

Around 3:00 P.M. Sunday afternoon the flooding in Big and Little Cottonwood Creeks were at a volume such that the next problem would be the Jordan River that is primarily fed by Utah Lake. Salt Lake County was advised these record flows would reach the Jordan River in the early evening hours and could produce another serious problem. This information was relayed to the Utah State Engineers Office, and the gates were closed about 7:00 P.M. Sunday evening.

Salt Lake County and Salt Lake City opened their maintenance areas to the public by late Sunday afternoon and provided free sandbags to anyone that desired them.

The rains continued into the early evening hours as the flood situation became critical. Sewage systems in the Murray area became inundated, several hundred homes were flooded, and many more people had to be evacuated. The high water pressure in the drainage systems lifted drainhole covers as water shot 10 feet in the air in some locations. Several homes suffered structural damage as Big Cottonwood Creek cut a new path through a housing division. Underpasses beneath Interstate 15 in the Midvale area filled with water, making passage impossible. Murray City Park, which was designed to provide flood control for that city, was doing just that and became filled with water from Little Cottonwood Creek which flows through the park.

By 6:00 P.M. Sunday evening the front began to move south as heavy rains began in the north portion of Utah Valley. At that time, the warning was continued along the Wasatch Front southward into north Utah Valley and north Wasatch County. Shortly thereafter, reports were received of heavy rains in the Alpine area of north Utah County with flooding reported in the Dry Creek area.

By Sunday evening, September 26, the Jordan River began to flood because of the tremendous inflow from the Cottonwood Creeks, augmented with water produced from impervious areas.

Later Sunday night a bridge across Little Cottonwood Creek was completely washed out at 6600 South and 1100 East. The roadway up Big Cottonwood Canyon to the Brighton/Solitude ski resorts was severely damaged in many areas due to the flows on Big Cottonwood Creek, making it impassable to traffic for about 5 days.

At 7:15 P.M. Sunday evening, another Flash Flood Watch was issued and extended to include the majority of Utah, with the exception of the southeast corner until 2:00 A.M. Monday, September 27. Additional Flash Flood Warnings/Statements were issued into the night for the Wasatch Front area northward into Wasatch County.

Light to moderate rains becoming briefly heavy at times persisted the majority of the night of September 26 in northern and western Utah. This continued to aggravate the flood situation in Salt Lake County as the ground was thoroughly saturated. The flood problem became severe early Monday morning along the Jordan River around 3300 to 3800 South. Numerous trailer parks were flooded with up to 3 feet of water and considerable property damage.

As the cold front continued to move in the evening hours, heavy rains began in the Uinta Basin and heavy thundershowers developed in the extreme southwest portion of the state. At 12:20 A.M. MDT Monday, September 27, a Flash Flood Warning was issued for a four-county area of southwest Utah including Zion National Park. Park personnel indicated 1.87 inches of rainfall in about an hour with 1.80 inches reported by a flash flood spotter in Rockville. A flash flood occurred between 2:00 and 3:00 A.M. Monday morning with a 2-hour lead time on the warning. Damage estimates have been tagged at about one-half million dollars with severe flooding of roadways and basements in the Springdale/Rockville areas of Washington County.

By Monday, September 27, the critical nature of the situation was noted as Governor Matheson of Utah declared a State of Emergency in Salt Lake County at noon. The Utah National Guard responded by 4:00 P.M. Monday afternoon with flood relief and filling sandbags.

The upper level trough over Utah continued to provide impulses that triggered additional precipitation into Tuesday, September 28. Flooding was still a problem along the Jordan River into Tuesday as the added rainfall enhanced the situation. The high water table in the lower portions of the valley was beginning to cause misery to homeowners. The sewage systems in Murray, Rose Park, and West Valley City were becoming taxed to their capacity with people encouraged to conserve waste water. The Utah National Guard was released at 8:20 P.M. Tuesday evening, September 28.

By Tuesday night, September 28, the record rains had subsided some with rainfall amounts along the Wasatch Front from Davis County southward into Utah County generally averaging 3 to 4 inches, but in the central and southeast portion of the Salt Lake Valley between 5 and 6 inches. A few areas on the southeast bench, such as the Olympus Cove area, recorded 6.59 inches precipitation, Sandy 6.40 inches, and the Alta Ranger Station in Little Cottonwood Canyon 7.91 inches.

Showery rainfall continued in the flooded areas through Thursday, September 30.

As September came to a close, record monthly rainfall amounts were logged with an unprecedented 7.04 inches recorded at the Salt Lake Airport, which was 1,035 percent of the 30-year normal precipitation. The wettest month ever at the Airport was 4.90 in April 1944. September rainfall amounts logged in the southeast portion of the Salt Lake Valley were over 9 inches in a few locations.

Meteorological Synoptic Patterns

METEOROLOGICAL SYNOPTIC PATTERN

A basic requirement for a rainfall which is to produce a flood is an abundant source of moisutre. The synoptic weather patterns for the few days preceding this flood event met this requirement well. An impressive visual satellite photo taken on Friday morning, September 24 (Figure 1) shows the extensive band of clouds extending from Hurricane Olivia, over the tropical Pacific, northward well into British Columbia. While not all of this moisture was produced by the hurricane, a good portion of it was, and contributed to the saturation of the airmass over Utah during the next four days. Figure 2 shows the increase in moisture over Salt Lake City from 00Z on Saturday, September 25, to 12Z Saturday. From 12Z Saturday through Tuesday, September 28, the air remained essentially saturated from the surface through 400 mb.

By midday Saturday the dying remains of Hurricane Olivia had moved to within 300 nautical miles of the southern California coast. Satellite pictures at this time (Figure 3) show cloud cover over most of Nevada and Utah while light rain had begun to fall over the area soaking the ground in preparation for large amounts of runoff the following day. Figure 4 shows the precipitable water values across the Western U.S. on Saturday evening (00Z Sunday). Note the band extending from southern California northeastward into southwestern Idaho of values that exceed one inch.

Meanwhile, an upper level low pressure center was moving out of the Gulf of Alaska onto the Pacific Northwest coast. Figures 5 through 7 show this system as it progressed southeastward. The vorticity patterns shown on these progs were not particularly helpful in timing upcoming events. For example, the chart for Sunday morning (Figure 6) actually showed an area of weak NVA over northern Utah, when the next 6 hours produced the heaviest rainfall of the storm. The mean relative humidity chart for Sunday morning (Figure 8) showed the state under an area of greater than 70 percent mean relative humidity. The 300 mb analysis and maximum wind charts for 12Z Sunday and 00Z Monday (Figures 9 through 12) show that the jet stream axis ran from central and southern California northeastward through eastern Montana during this period. This feature provided plenty of venting action for the thundershowers which would form along the front and an occasional jet maximum which would additionally enhance the activity over northern Utah at times. Such a jet maximum shows up over southwestern Idaho and northcentral Nevada at 12Z Sunday (Figures 9 and 10), which is a good location to provide divergence aloft and thereby enhance the vertical motion over northwestern Utah.

Surface charts for 12Z Sunday through 00Z Monday (Figures 13 through 15) show a slow moving cold front from central Montana south through Wyoming, then southwest through Utah and into central Nevada. A low pressure center located over central Nevada just north of Ely (Figure 13) appeared to move eastward along the front through 21Z (Figures 14 and 15). This low was no longer discernable by 00Z Monday (Figure 16). Radar displays for this period (Figures 17 through 20) show heavy convection just to the north of the low during this time which corresponds to the period of the largest accumulation of rain

during the storm. Surface winds reported at the Salt Lake International Airport were out of the northwest behind the front. The canyons in the Wasatch Mountains slope upward to the east, in particular Big and Little Cottonwood Canyons. This, of course, adds upslope lifting to an already unstable airmass, further enhancing the rainfall in these areas. Persons with the City Water Department who were in the area at the time commented that the rainfall seemed especially heavy in the vicinity of Storm Mountain in Big Cottonwood Canyon. The upper level flow patterns shown in Figures 6 and 7 help explain why the front was slow moving. Figure 7 shows the upper low digging almost due south through California during the period. This digging resulted in a flow aloft over Utah which was parallel to the front.

By Sunday evening (00Z Monday September 27), the upper low had moved onshore and was located over western Oregon (Figures 7 and 21). The heaviest rainfall, however, was in southwestern Utah along the cold front (Figures 22 and 23). The satellite pictures at this time showed another well-formed band of activity over central Nevada behind the front. This was probably an impulse moving around the south side of the trough as the low continued southeastward. An extensive area of light to moderate rainfall continued over all of western Utah, however, and added more water to already overflowing streams.

On Monday morning the upper low center was over northern Nevada (Figure 24) with at least two smaller impulses rotating around it which would have trajectories over Utah. The surface front (Figure 25) was now located over extreme southern Utah or northern Arizona with steady rainfall continuing behind it. Additional rains were associated with the movement of the upper low through Utah and fell on already saturated ground. In some locations where the ground is essentially rock, the majority of the water had already been running off from the surface for 12 to 24 hours. Figure 26 shows a distinct banded cloud structure from north to south across the state. This storm, like most, consisted of bands of strong cellular activity which appeared to form over Nevada and then move eastward into Utah.

By Monday evening (Figure 27), the upper low was over southern Nevada and southwestern Utah with a full latitude trough extending from the low to the Arctic Circle. This trough continued to move eastward slowly with most of the activity to the northeast of the low (Figures 28 and 29). Additional flooding problems occurred over the north as the low began to open up and dumped another 1.38 inches of rain at the Salt Lake International Airport between 6:00 P.M. Monday and 6:00 A.M. Tuesday.


Forecasts
Watches
Warnings

FORECAST/WATCHES/WARNINGS

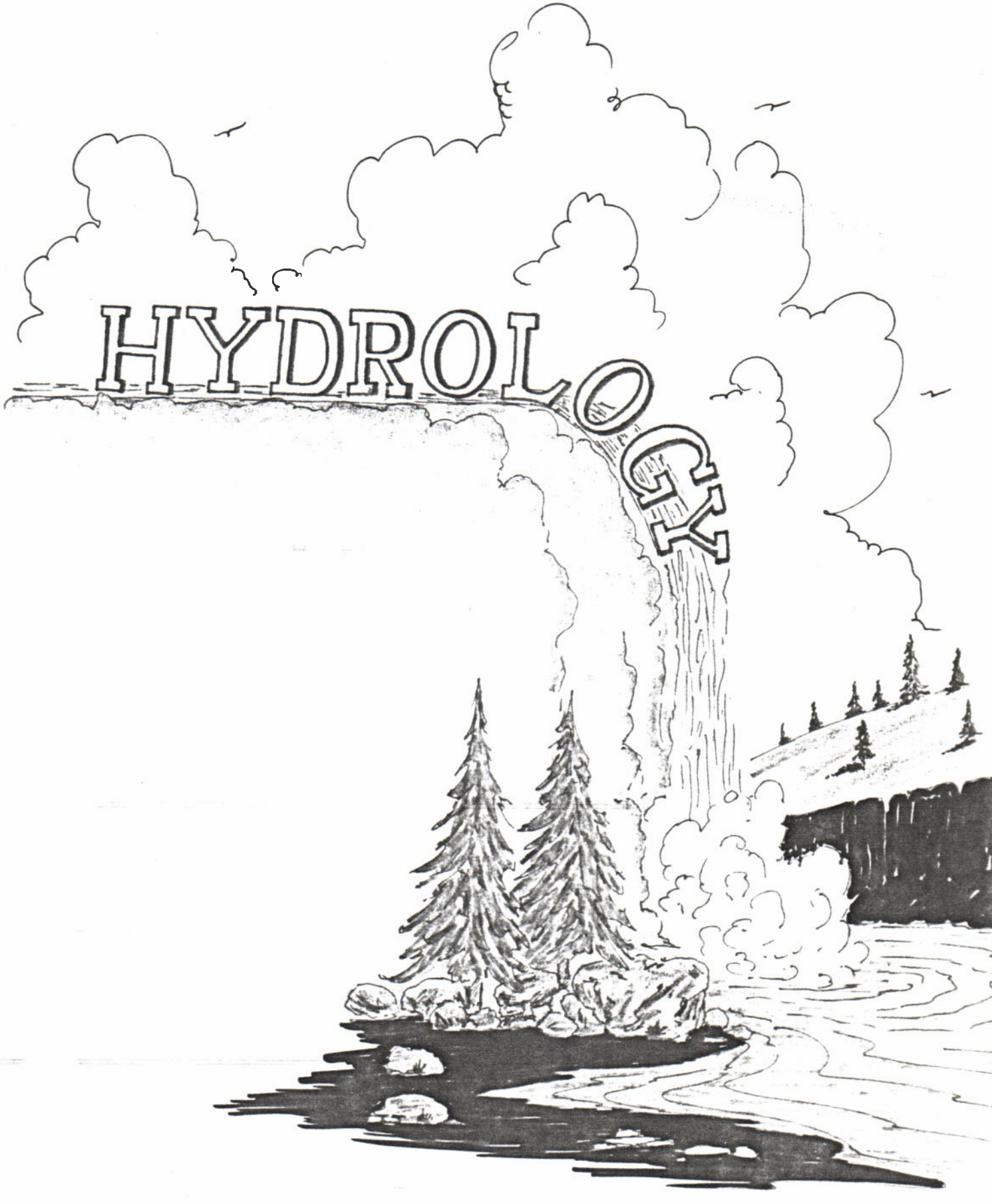
The potential for heavy rainfall and a substantial storm was first discussed on our internal releases as early as Thursday, September 23. Friday afternoon and evening, September 24, the tropical moisture began to move rapidly north from Hurricane Olivia. By this time, the shower threat for the weekend was becoming definite.

The Friday evening, September 24, computer output indicated a serious situation was in the offing by Sunday as the LFM model indicated the cold front, upper level trough, and tropical moisture were on a collision course over Utah--especially in the north. The three evening television weathermen were briefed around 9:30 P.M. to the pending situation and a potential for heavy rains and some associated flooding by Sunday, September 26.

The local (Salt Lake, Ogden, and Provo) and northern zone forecasts contained the message of heavy rains on Sunday beginning with the 4:00 A.M. Saturday, September 25, package. The forecasts through Saturday and into Sunday were consistent with this trend towards heavy rainfall.

A Flash Flood Watch was issued for northern Utah at 9:00 A.M. Sunday, September 26, for the majority of the counties--from Utah County northward along the Wasatch Front. By 9:30 A.M. Sunday, a Flash Flood Warning was issued from Bountiful north, and at 11:00 A.M. Sunday, the Flash Flood Warning was extended southward to Point-of-the-Mountain. The severe flooding in the Salt Lake Valley began about 4:00 P.M. Sunday afternoon, September 26, which provided a 7-hour lead time on the Flash Flood Watch and a 5-hour lead time on the Flash Flood Warning.

Numerous Flash Flood Statements/Watches/Warnings were issued through Tuesday, September 28 as the flood situation remained serious, especially in the Salt Lake Valley.


HYDROLOGY

HYDROLOGY

Throughout the Salt Lake Valley the rain storm of September 24, 1982 thru September 28, 1982 produced record or near record amounts of precipitation. Subsequent record flooding occurred on the Jordan River, and Big and Little Cottonwood Creeks. Rainfall amounts collected ranged from near three inches at the south end of the valley near Alpine to 6.5 inches at the center at the lower reaches of Little Cottonwood Canyon. See Figure 1 and 2 and Table 1. Most stations received over four inches. The area of rainfall which produced the major creek flooding was near the lower reaches of Big and Little Cottonwood Canyons. This flood producing rainfall appears to have occurred between 10 AM September 26, and 6 PM September 26. This creek flooding (not to be confused with the urban flooding which occurred later and possibly simultaneous and in conjunction with the creek flooding) was primarily restricted to Big and Little Cottonwood Creeks and the Jordan River near their confluence. This occurred Sunday afternoon into Monday along the lower reaches of Big and Little Cottonwood Creeks and along the Jordan confluence. Very slight rises occurred on all other creeks and rivers in the area from the Weber north to the Provo south and including the other Six Creeks draining the Salt Lake Valley, Figures 3-8.

Preliminary data showed Little Cottonwood Creek had two peaks, first near 2 PM September 26, 1982 and the second near 6 PM, both record flows. The rainfall producing these peak occurred from 10 AM to 6 PM on the 26th. The rainfall amounts were near 3.0 inches for a 12-hour period extending to 10 PM, shorter duration amounts near 3.0 inches occurred in a small area near the mouth of Big Cottonwood. The exact duration is not known. On Big Cottonwood the rainfall was near 3.5 inches for the same time period and produced one peak occurring near 7 PM. Preliminary data indicates a possible second peak near 10 PM. The river gage at Argenta on Big Cottonwood showed a peak of near 200 cfs. This gage was at less than 7,000 feet elevation and seven miles up the canyon. This shows the runoff was mostly generated at the lower reaches of these basins.

Even though flooding was not caused by other creeks producing runoff, urban flooding appears to have occurred extensively in Salt Lake City proper from the other Six Creeks, (Mill, Parleys, Emigration, and City Creeks). But this flooding was due to impervious urban areas suppling flows into these creeks and areas which do not drain. This urban flooding lasted longer than the flooding from Big and Little Cottonwood Creeks, and was primarily due to the longer duration rainfall regime. Rainfall of the intensity and amounts to produce flooding on Big and Little Cottonwood only occurred for a short period on September 26. But much lesser amounts occurred thru September 28, 1982 throughout the state as well as Salt Lake Valley.

While the precipitation was not confined to the Salt Lake Valley, generally flooding occurred throughout the Valley due to much impervious area and saturated conditions.

This report deals with the flooded area, eventhough precipitation generally occurred throughout the state. Many mountain reports in northern Utah showed amounts in excess of nine inches of precipitation. Much of this occurred as snow falling from September 26, 1982 thru September 30, 1982. Streams also rose in the many areas of the state but generally only slightly.

The Sacramento District COE and CBRFC have previously modelled Big and Little Cottonwood Creeks; the Corps for planning purposes and CBRFC for potential forecasting. The Corps used all archived and available data and found at no Historical time had a rain flood occurred on these two creeks. The hydrology of these basins is extremely complex with limited data. Basins of similar size receiving this amount and duration of rainfall generally produce much higher peak flows. For example, similar size basins near Denver, Colorado have produced flow many times these.

Such factors as bedrock fractures, rainfall intensities, storm movement all combine to complicate the water distribution and movement. Past calibrations were limited to snowmelt runoff and the limited data would indicate less than the estimated 1,000 cfs which occurred. Synthetic computations indicate flows in excess of 8,000 cfs, a contradiction.

The most frustrating aspects for forecasting the event was that this was the first rain produced flood in Little and Big Cottonwood Creeks. There was no realtime flow data available for any streams in the Salt Lake Valley and only spotty rainfall reports. The rainfall distribution was only partially understood. City Creek had three crests from 10 AM September 26 thru 10 PM September 27th. Generic forecasts were given by SLC WSFO to the county flood control section. Some significant decisions were made on the guidance received.

The most effective guidance given by CBRFC was, 1) estimating the time of peaking of these flooded areas at late Sunday night and continuing in the Jordan into Monday, 2) that the flooding would probably be a record but with no observed data available, definition could not be given, 3) that the Jordan River would probably overflow its banks, 4) estimating mudslide potential and 5) forecasts of little flooding on other major drainages outside the valley would occur. Identifying the likely areas of no flooding seems to be compatible information to delineating flooding sites.

The DATACOL system was kept current by CBRFC for use by the county and WSFO personnel. This was the only source of real time data for CBRFC eventhough the only local area data effecting Salt Lake Valley were for Mountain Dell Dam, Silver Lake Brighton precipitation and, RAWS data from GOES at Ensign Peak. At the time Ensign Peak data were questioned even-though it appears correct now, especially with three small peaks occurring on City Creek. The reason was the rainfall at the site had not occurred in large enough amounts to cause concern until late Sunday night, the 26th, and Monday morning, the 27th.

In conclusion it appears that urban flooding occurred extensively. Flash flooding occurred locally on Big and Little Cottonwood Creeks with urban flooding in low lying areas on the Jordan River between 2500 South and 3900 South.

In retrospect, eventhough RFC forecasts are for gaged points with data networks for hydrologic analysis, a river statement on the Jordan River could have been released. This may be questionable as it was an urban drainage area and flash flooding and urban runoff produced the overbank conditions. They were not from the Jordan River itself.

BIG AND LITTLE COTTONWOOD SCENARIO

Record breaking flows erupted from Big and Little Cottonwood Creeks as a result of the 100-year downpour on the morning and afternoon of September 26, 1982.

Big Cottonwood Creek had a peak of 1095 cfs at 7:30 PM on September 26, 1982 This topped the previous peak record of 835 cfs which occurred on June 6, 1909, and was 310% greater than the snowmelt peak of this spring which occurred on May 29, 1982 with a peak of 353.3 cfs.

Little Cottonwood Creek peaked at 1135 cfs on September 26, 1982 at 2:00 PM. This elapsed the prior peak of record, 762 cfs, which occurred on June 11, 1921 and was 2.4 times greater than the May 27, 1982 snowmelt peak of 471 cfs.

Mill Creek, which is adjacent to Big Cottonwood Creek, has a peak flow of only 46.4 cfs which is 69% of the snowmelt peak which occurred on May 27, 1982, and is far off the peak of record of 152 cfs which occurred May 20, 1969. The other three Creeks (City Creek, Emigration Creek, and Parleys Creek) showed only mediocre rises as result of the storm.

Two factors contributed significantly to the record breaking flows of the Cottonwood Creeks whereas other creeks in the area had no problems. First the heaviest pocket of rainfall was over lower half of the Cottonwood basins. Cottonwood Weir recorded 4.0 inches in the 12-hour period from 10:00 AM to 11:00 PM. In the upper portion of the basin, Silver Lake Brighton reported 1.90 inches for the same period. The second factor is the geology of the canyons. The lower portion of Little Cottonwood Canyon is approximately 60% surface rock (mostly granite), and Big Cottonwood is about 40% surface rock. In contrast, Mill Creek and the Canyons to the north have a minute percent of surface rock or impervious area.

Table 1. HOURLY PRECIPIATION

September 26, 1982

HOUR ENDING	STATIONS						
	COTTONWOOD WEIR	SILVER LAKE BRIGHTON	ARGENTA	MOUNTAIN DELL	OLMSTEAD PH(Provo)	BOUNTIFUL VAL VERDE	SLC AIRPORT
01							
02							
03							.07
04			.10	.10	.10		.04
05							.04
06		.20	.20	.20			.02
07			.10			.08	.03
08		.10			.10	.08	.03
09						.04	.23
10				.10		.08	.35
11	.40	.30	.20	.40		.28	.30
NOON	.40	.10	.60	.20		.42	.21
13	.60	.10	.60	.10	.20	.22	.12
14	.30		.60	.10		.12	.20
15	.50	.50	.30	.30		.10	.05
16	.40	.30	.50	.20	.10	.15	.05
17	.40	.20	.40	.10	.10	.08	.04
18	.20	.20	.20	.20	.40	.04	.16
19	.30	.10	.10	.10		.04	.13
20	.30	.10	.20	.20	.10	.21	.09
21	.20		.10	.20	.20	.12	.06
22	.10		.10		.10	.14	.01
23		.20		.10	.10	.08	.02
Midnight			.10			.02	.02
TOTAL	4.10	2.40	4.40	2.60	1.50	2.30	2.27

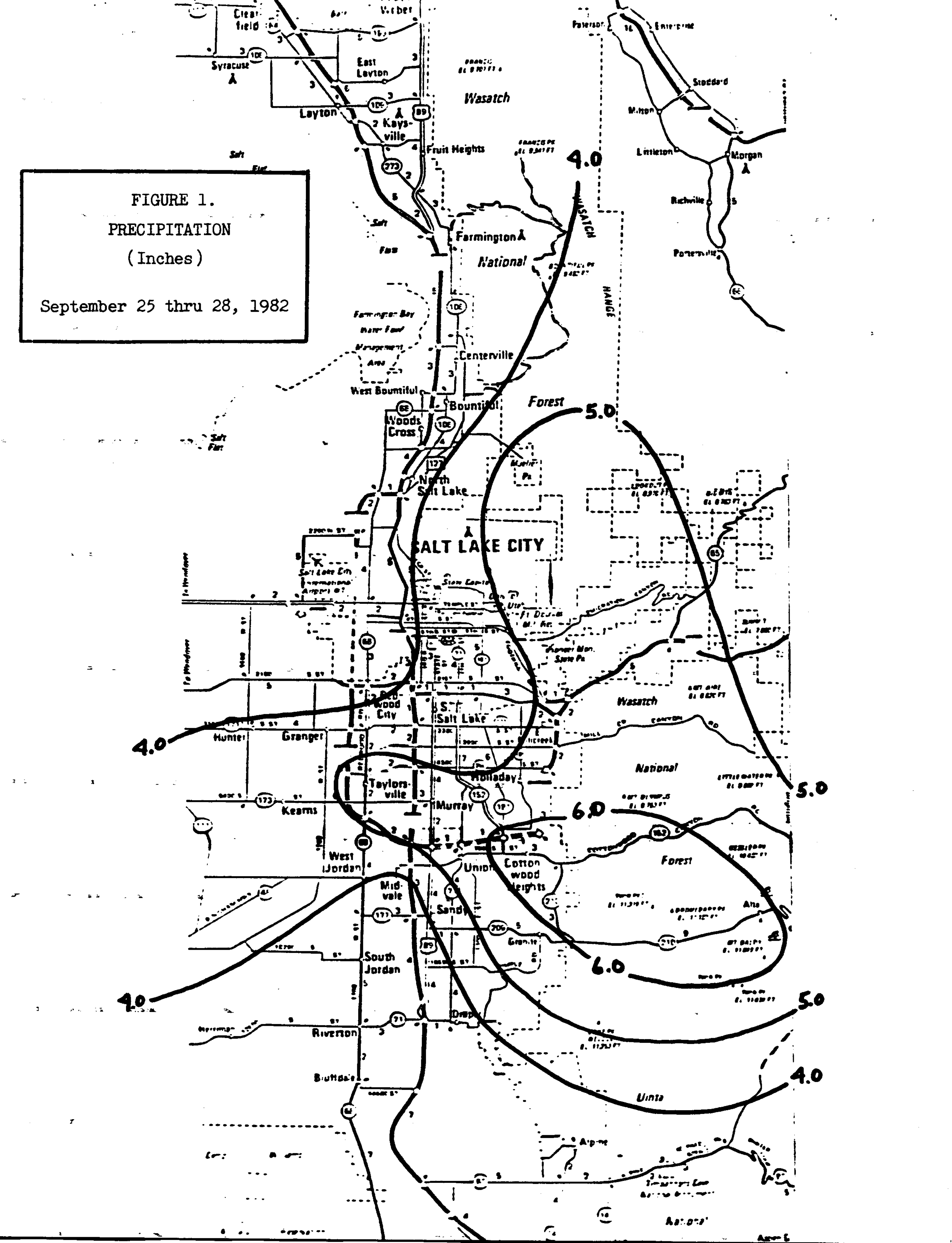


FIGURE 1.
PRECIPITATION
(Inches)

September 25 thru 28, 1982

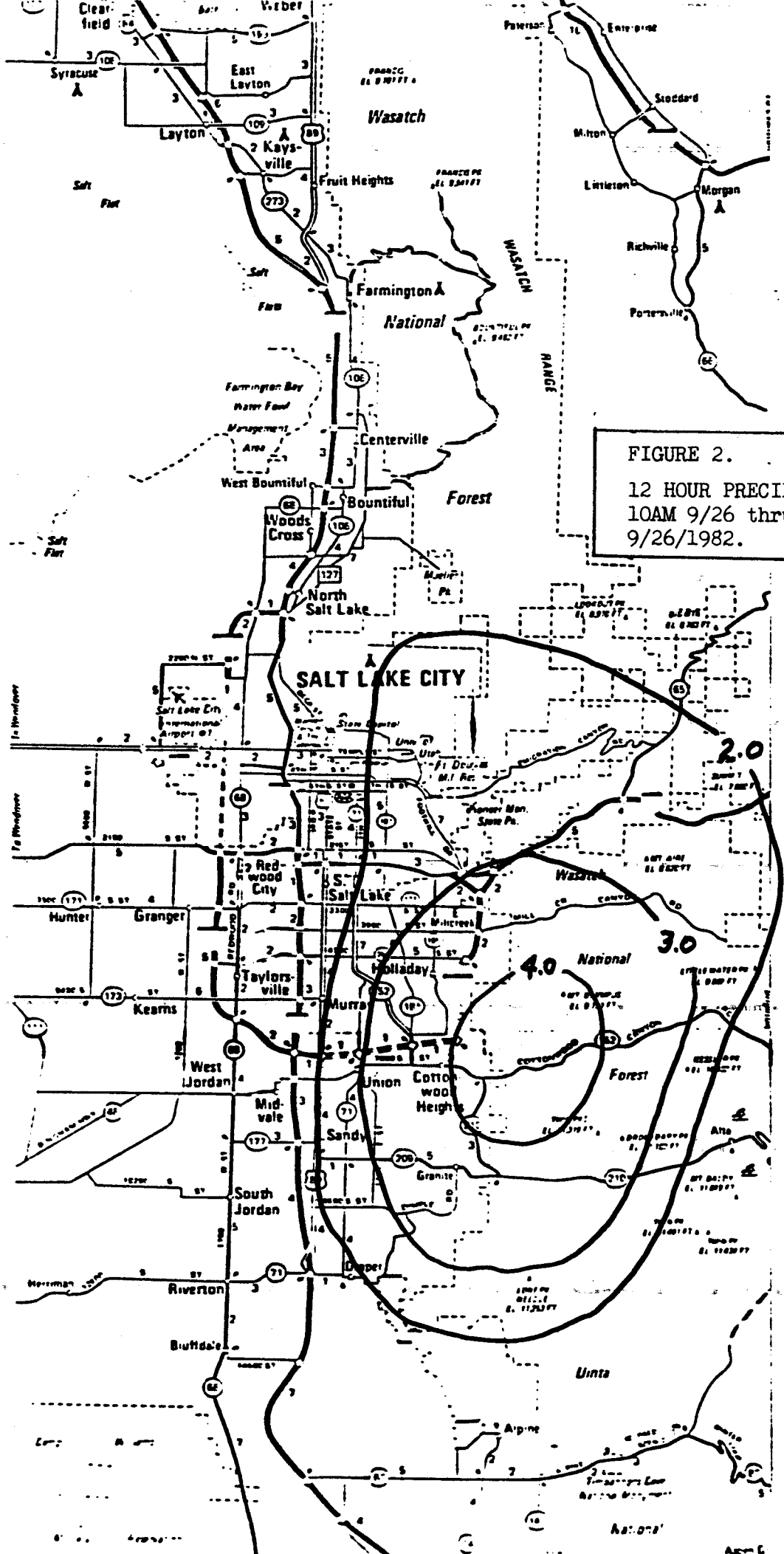


FIGURE 2.

12 HOUR PRECIPITATION
10AM 9/26 thru 10 PM
9/26/1982.

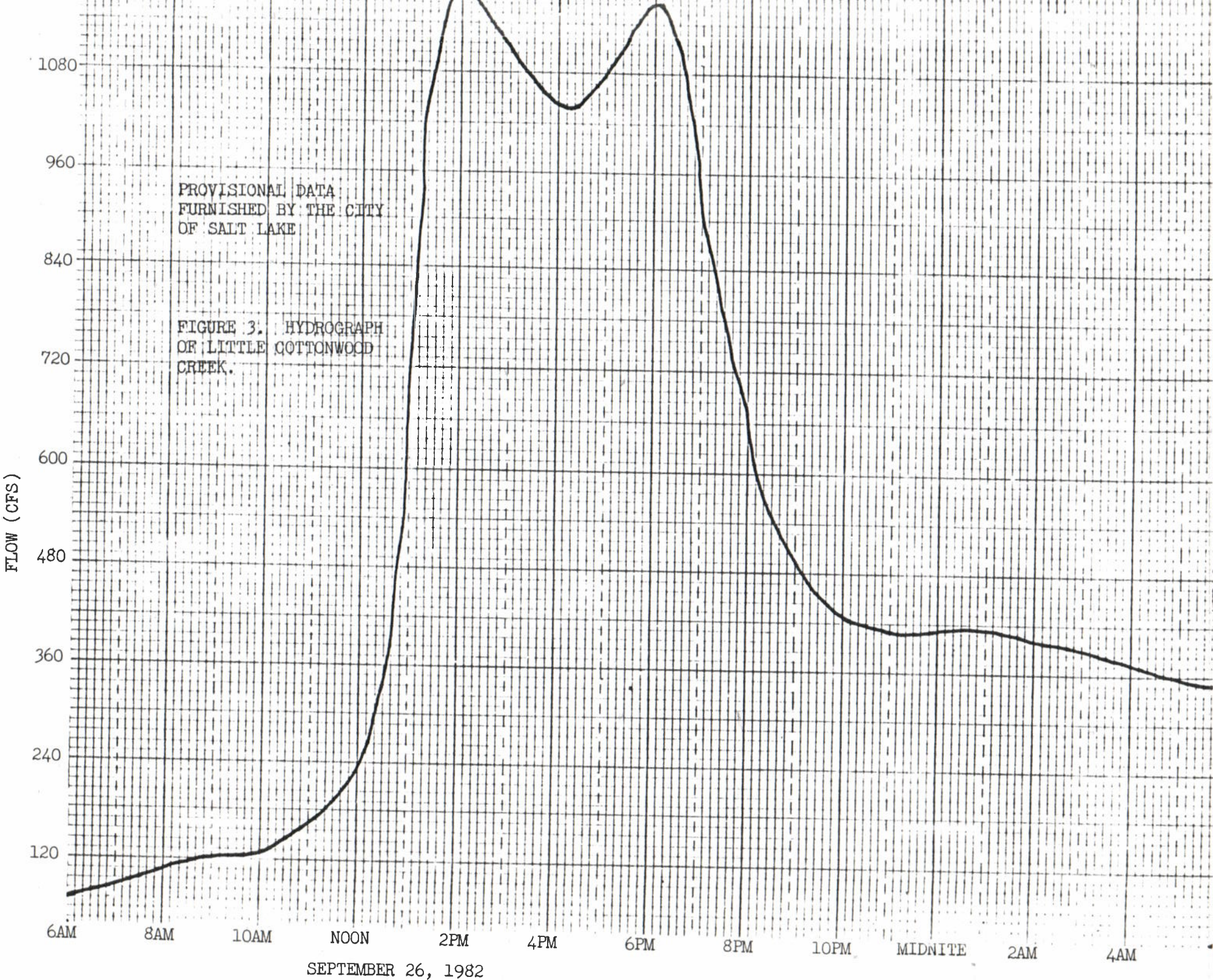
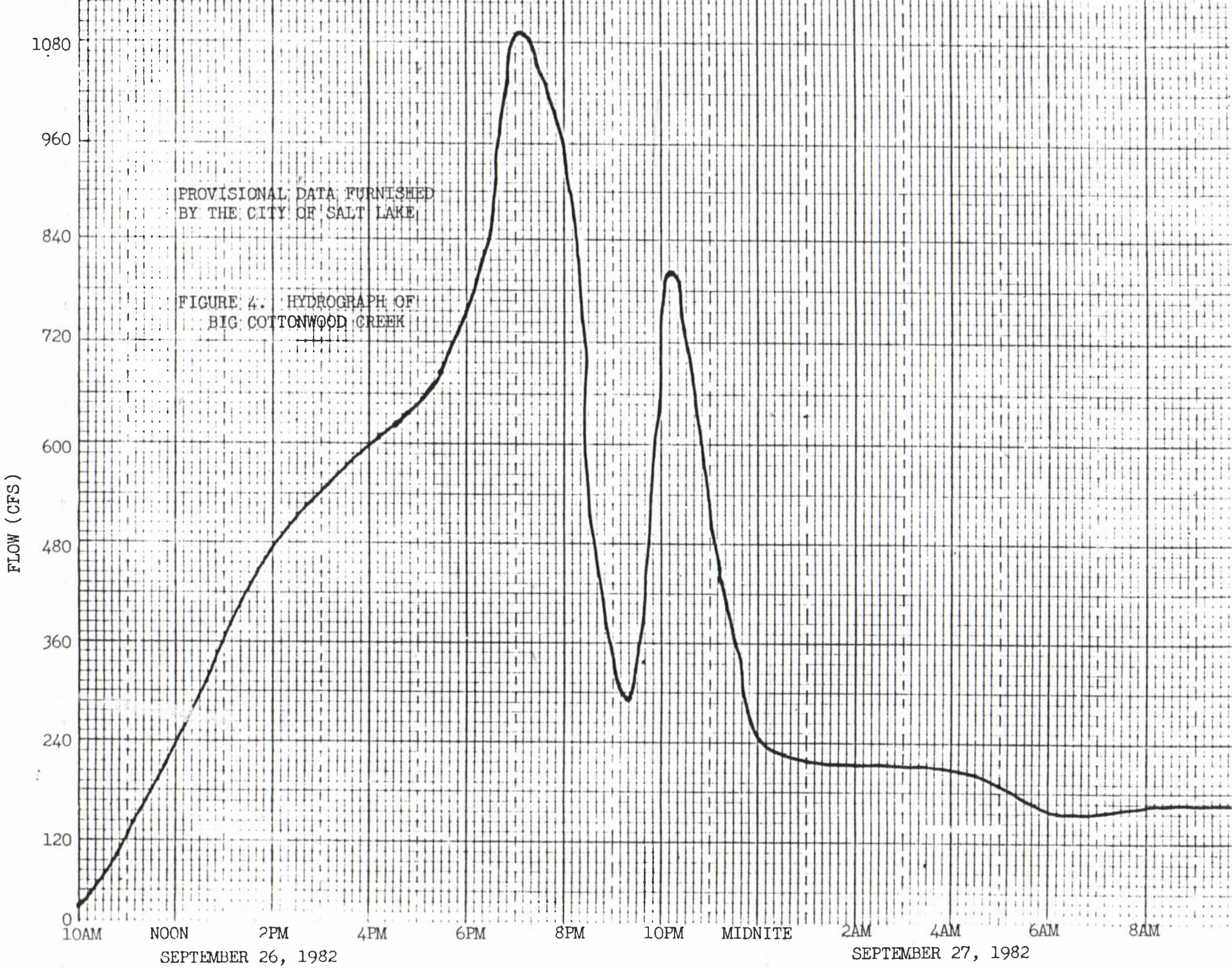


FIGURE 3. HYDROGRAPH OF LITTLE COTTONWOOD CREEK.



PROVISIONAL DATA FURNISHED
BY THE CITY OF SALT LAKE

FIGURE 4. HYDROGRAPH OF
BIG COTTONWOOD CREEK

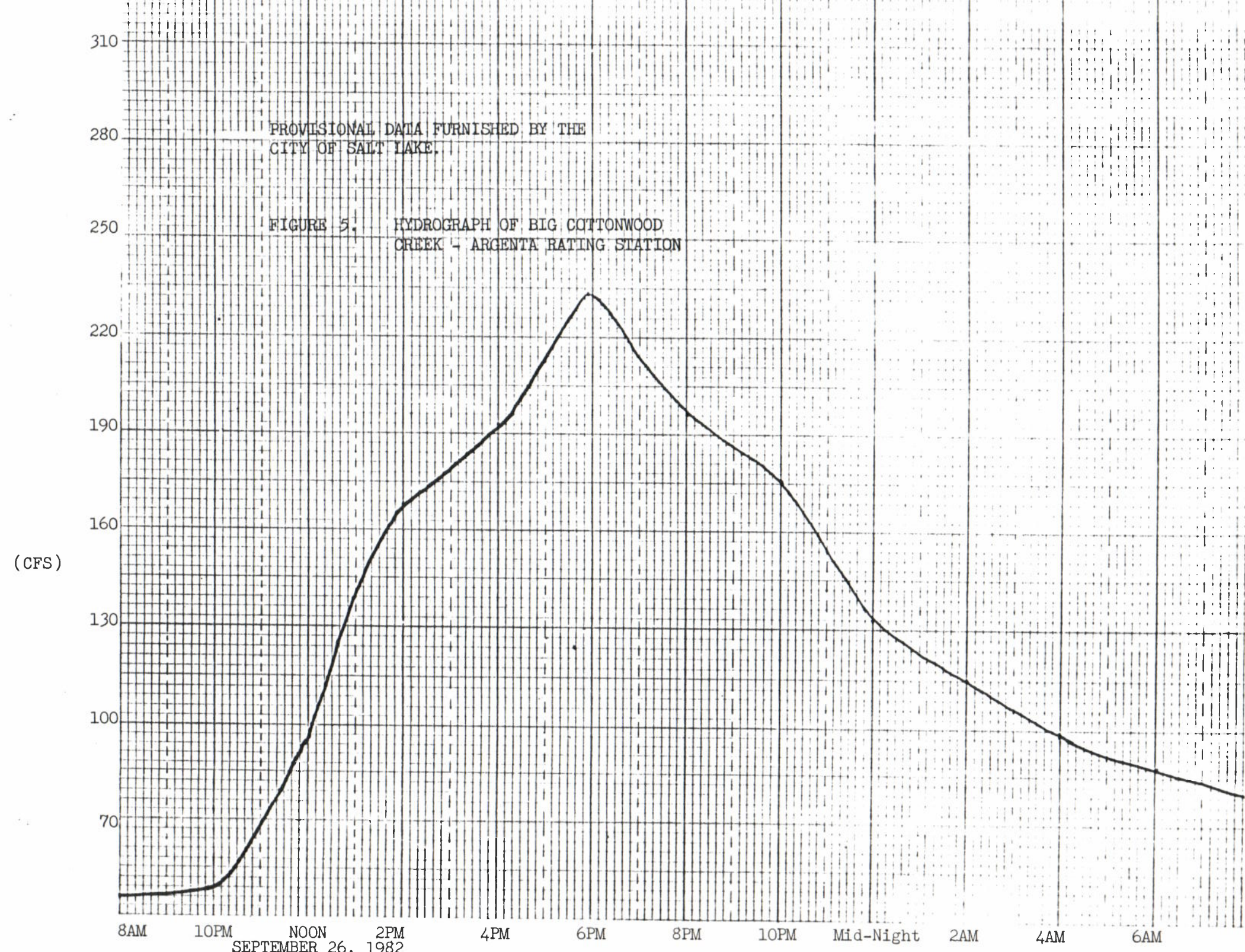


FIGURE 5. HYDROGRAPH OF BIG COTTONWOOD CREEK - ARGENTA RATING STATION

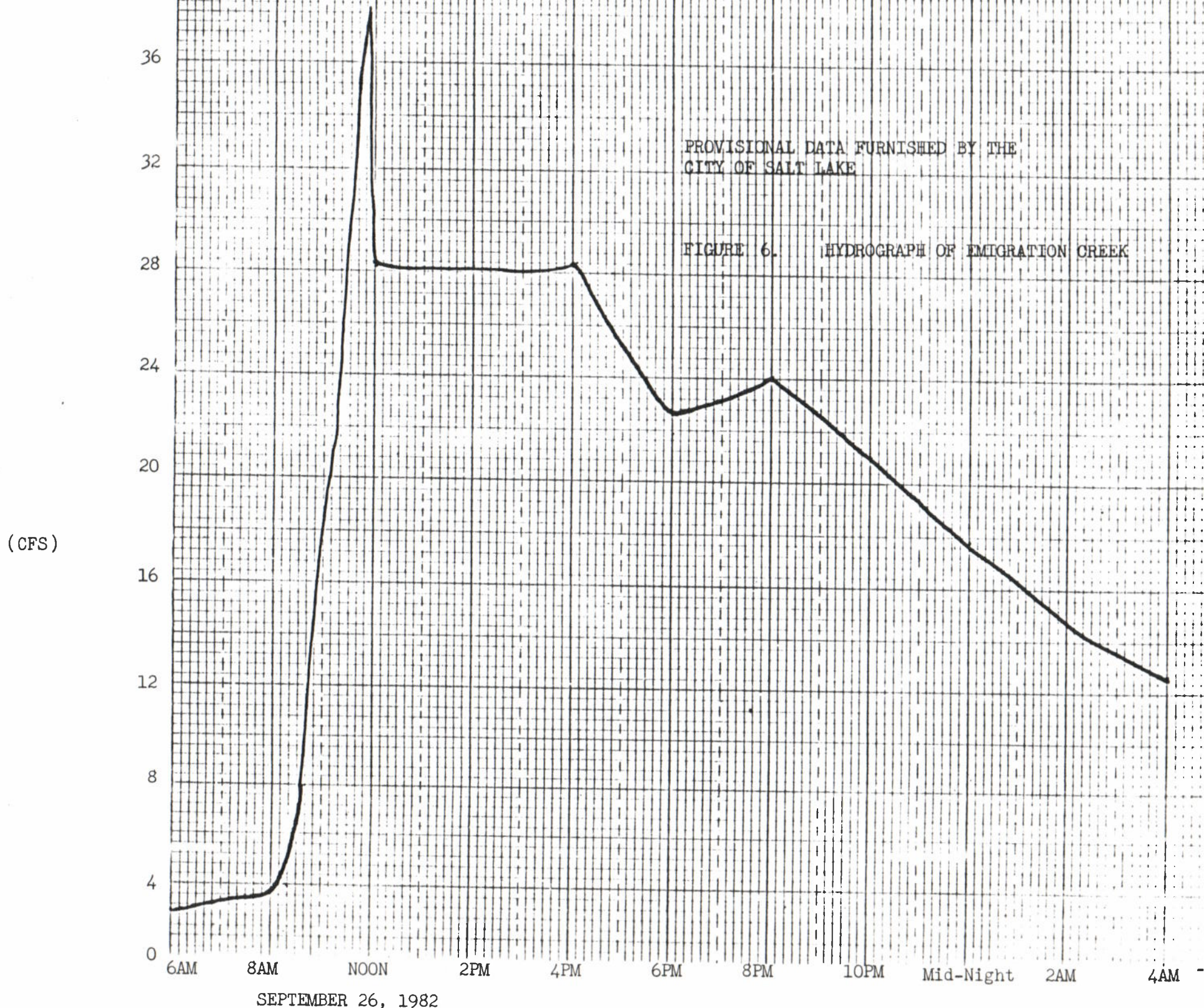
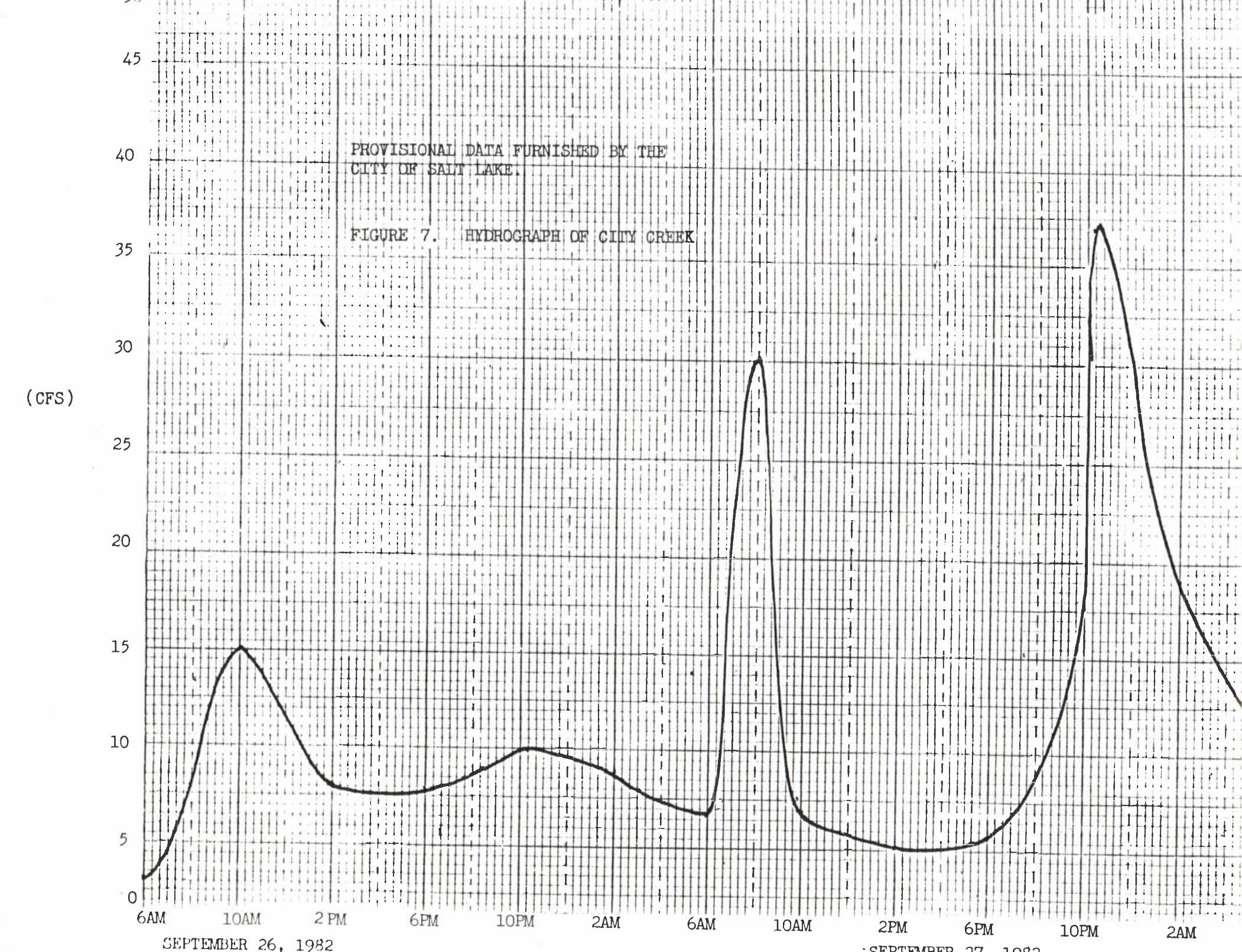
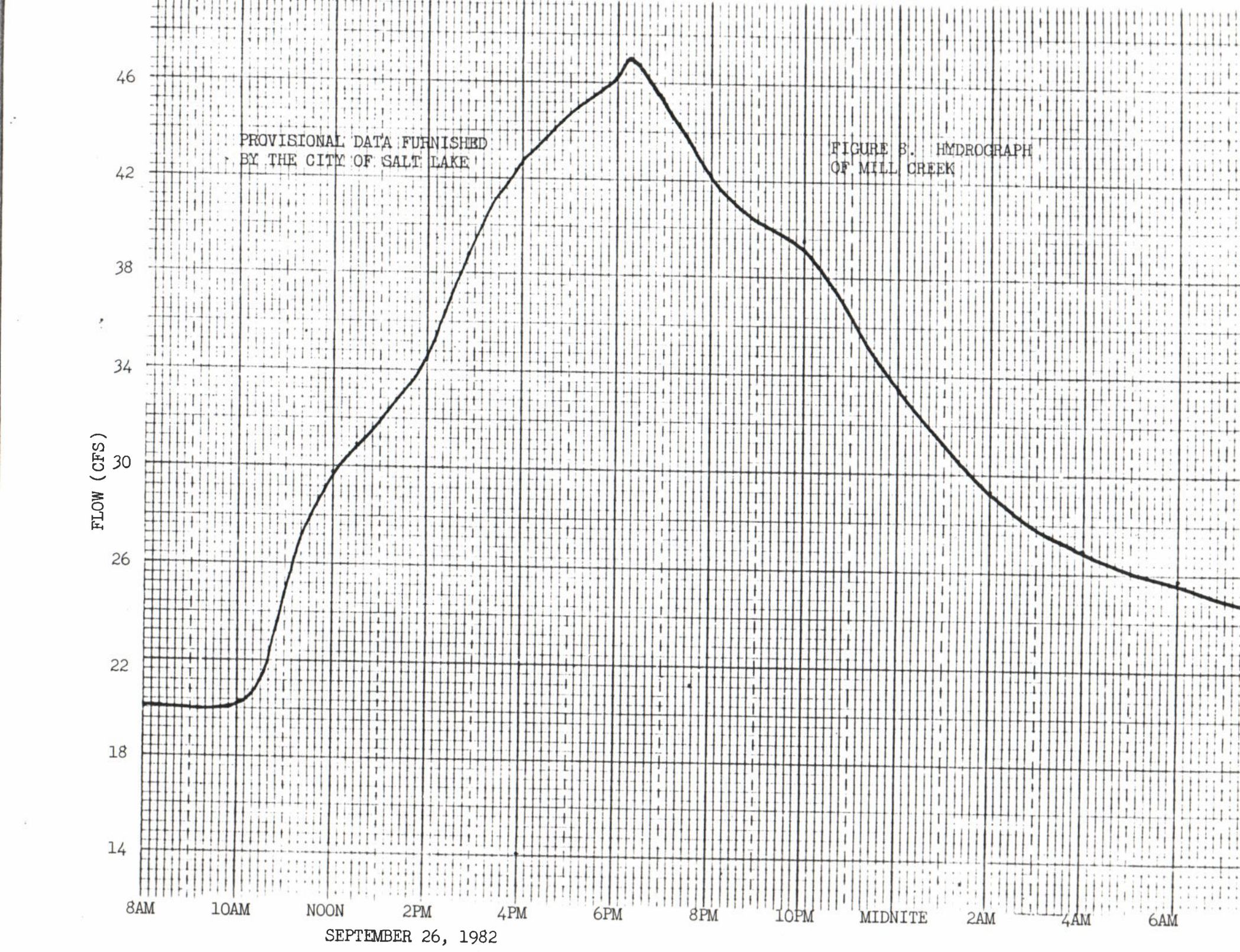


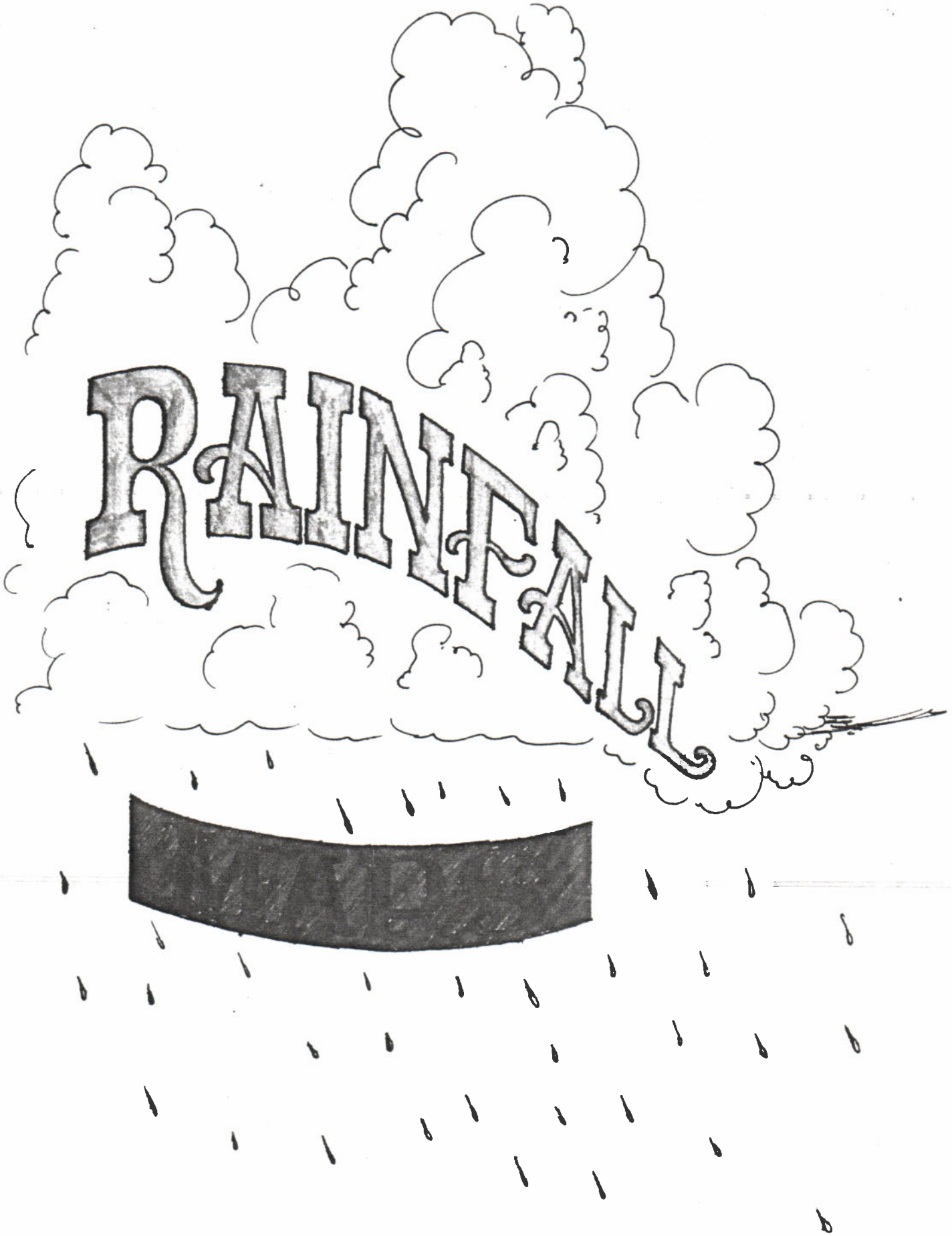
FIGURE 6. HYDROGRAPH OF EMIGRATION CREEK



PROVISIONAL DATA FURNISHED BY THE CITY OF SALT LAKE.

FIGURE 7. HYDROGRAPH OF CITY CREEK


PROVISIONAL DATA FURNISHED
BY THE CITY OF SALT LAKE
FIGURE 8. HYDROGRAPH
OF MILL CREEK
FLOW (CFS)
46
42
38
34
30
26
22
18
14
8AM
10AM
NOON
2PM
4PM
6PM
8PM
10PM
MIDNITE
2AM
4AM
6AM
SEPTEMBER 26, 1982

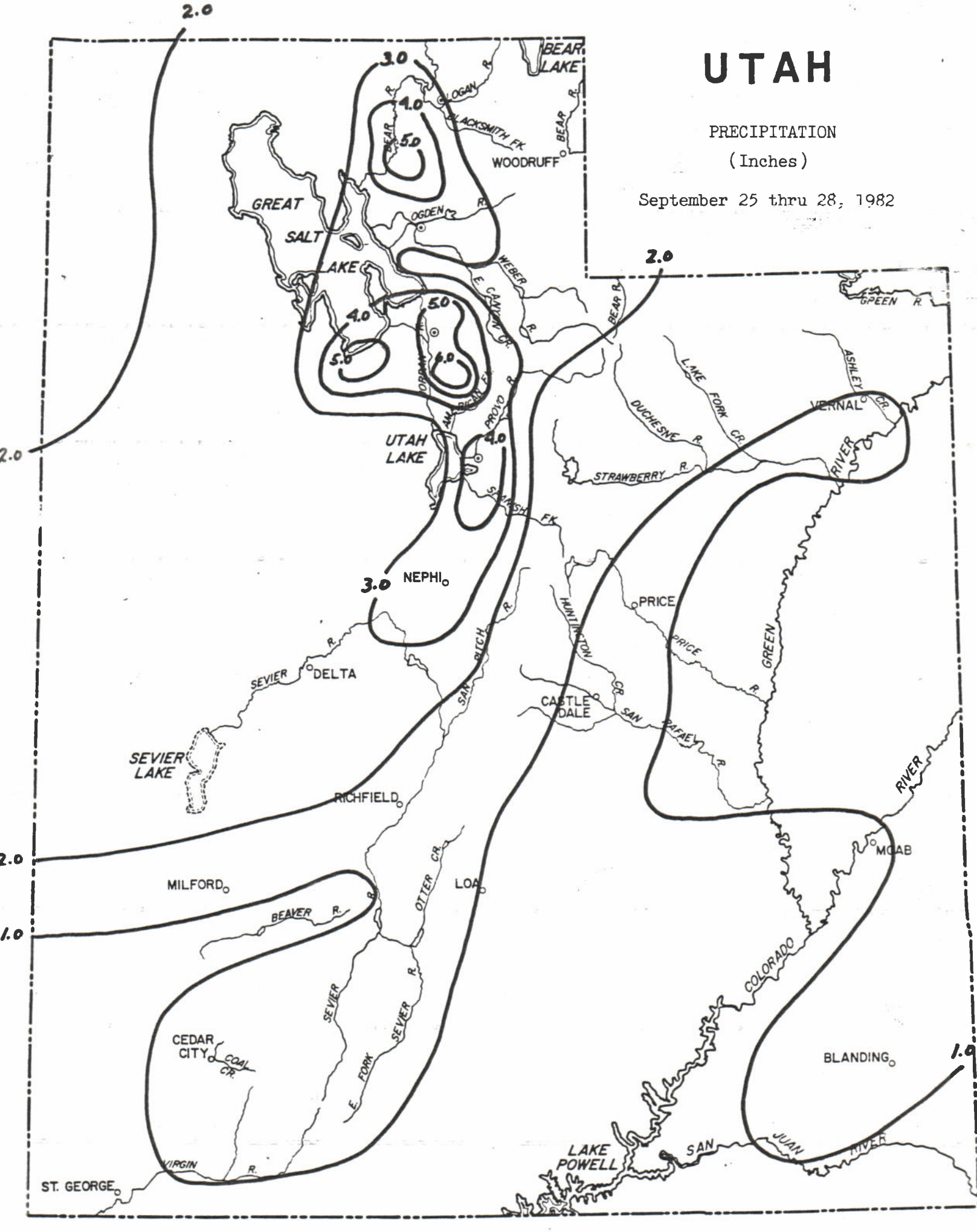

RAINFALL

UTAH

PRECIPITATION

(Inches)

September 25 thru 28, 1982



CRITIQUE

CRITIQUE

The forecasts/statements/watches/warnings were timely and well written. The screaming message was heavy rainfall and the associated problems of urban and stream flooding. The problems of mud slides in the canyons was also addressed. A lead time of 5 to 7 hours on the warnings and watches was outstanding. The dedication of the National Weather Service staff was fantastic, with many working extra hours during this critical weather situation.

KSL Radio, our key Emergency Broadcast System (EBS) station, did an outstanding job during this one-in-a-century storm. Eighty percent of their broadcast time was devoted to the storm and actions the public could take to prevent additional property loss. A letter was written to KSL for the tremendous service to the public during this crisis.

We worked well with the Comprehensive Emergency Management Office in Salt Lake, keeping the Staff Duty Officer appraised of the flood situation. Salt Lake County Flood Control was in constant contact with the National Weather Service and some key decisions were made on our forecasted precipitation amounts. The decision to terminate the flow from Utah Lake into the Jordan River Sunday evening was coordinated through the National Weather Service/Colorado Basin RFC. This decision was responsible in minimizing the flood damage along the Jordan River later Sunday night and Monday morning.

It was felt that having this major storm on a Sunday had some positive aspects. The response time of Salt Lake City, Salt Lake County, Murray, and West Valley City personnel was incredible. There was only so much they could do with sandbags and controlling the record rivers of water. School children were at home or at church with their parents, and this prevented what could have been some loss of life. A child could have fallen into a swollen creek and drowned walking home from school.

If this storm would have occurred on a weekday, the Salt Lake Valley commuters would have encountered real problems going home due to street closures and areas of high water.